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Examination request in accordance with § 44 German Patent Act (PatG) has been filed.

(54) **Non-Woven Pile and Method for its Production**

Claims

1. A non-woven pile comprising at least one single- or multi-colored needled non-woven sheet, characterized in that it also comprises a plastic film (2), preferably a polyethylene or polypropylene film having a thickness of 70 to 300 μ, particularly 100 to 150 μ, and is needled through the fiber material of the non-woven sheet to form the pile structure (5), which forms the visible surface of the non-woven pile.

2. A non-woven pile according to claim 1, characterized in that the plastic film (2) is disposed between at least two non-woven sheets (1, 3) and that the fiber material of one non-woven sheet (1) is needled through the plastic film (2) and forms the pile jointly with the fiber material of the non-woven sheet (3).

3. A non-woven pile according to claim 2, characterized in that the plastic film (2) is disposed between non-woven sheets (1, 3) with contrasting colors.

4. A non-woven pile according to claim 3, characterized in that at least one non-woven sheet (3) is partially provided with a binding agent application (4).

5. A non-woven pile according to claim 4, characterized in that a non-woven sheet comprising a binding agent application (4) is disposed on either side of the plastic film (2).

6. A method for producing a non-woven pile comprising at least one single- or multi-colored non-woven sheet, characterized in that the non-needled non-woven sheet is brought in contact with a plastic film across its surface and the fiber material of the non-woven sheet is needled through the plastic film to form the pile structure.

7. A method according to claim 6, characterized in that the plastic film is placed between two non-woven sheets prior to the unpinning operation and that this layer material is needled jointly from one side.

8. A method according to claim 7, characterized in that the plastic film is placed between two non-woven sheets with contrasting colors.

9. A method according to claim 7, characterized in that the plastic film is placed between two non-woven sheets with contrasting colors, of which at least one is provided partially with a binding agent application prior to the joint unpinning operation.

10. A method according to any one of the claims 6 to 9, characterized in that the material panels consisting of at least one non-woven sheet and one plastic film, respectively, are guided separately past one side of a common lamellar grid and that following the unpinning of the fibers of the non-woven sheets the pile-needled material panel leaving the common lamellar grid is cut open through the plastic film substantially along its midplane.

11. A method according to claim 10, characterized in that two material panels are guided along both sides of the lamellar grid for the purpose of simultaneous pile needling, which panels comprise two non-woven sheets with the interposed plastic film.

12. A method according to any one of the claims 6 to 11, characterized in that a polyethylene or polypropylene film having a thickness of 70 to 300 μ, particularly 100 to 150 μ is used as the plastic film.

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Non-Woven Pile and Method for its Production

Non-woven pile comprising at least one single- or multi-colored needled non-woven sheet and/or method for producing such non-woven pile are known and disclosed, for example, in the German unexamined patent applications numbers 19 01 753, 20 08 439, 22 11 023 and 26 15 519 from the same inventor.

In the production of non-woven pile, significant attention must be paid to the optimization of the unpinning operation and/or the increase in the raw pile density, so that the unpinned fiber material portion in relation to the overall fiber weight improves so as to achieve the least possible fiber material usage and an upper side of the non-woven pile that has the highest density and volume possible.

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It is the object of the invention to optimize the unpinning step, i.e. increase the raw pile density in the finished material, with a non-woven pile using simple means that require little material, while employing conventional needling techniques, such as the one mentioned above using a conventional pile needling machine comprising a lamellar grid.

To achieve this object, the non-woven pile according to the invention comprising at least one single- or multi-colored non-woven sheet is characterized in that it comprises a plastic film, through which the fiber material of the non-woven sheet is needled to form the pile structure, which forms the visible surface of the non-woven pile. The use of a plastic film of this type surprisingly leads to a significant increase in the raw pile density, specifically one that is comparable to the raw pile density achievable with tufted material. It can be assumed that the surprising improvement and/or increase in raw pile density is achieved in that the elastic restoring properties of the plastic film material prevent the fiber or fiber loop that is needled through the plastic film from being retracted again into the fiber batt during the backward movement of the needle that is used for the unpinning step. It appears that the effect similar to that of a "non-return valve" exists in the regions of the individual openings formed by the needles, through which the fiber and/or fiber loop has been pulled.

Another advantage when using a plastic film is that it assumes a transport function for the formed pile rows, similar to the function of the backing in tufting.

The non-woven sheets to be needled are relatively weak structures that tend towards uncontrolled draft, so that it is extremely difficult in the case of patterned non-woven fabric to maintain defined patterns within a non-woven sheet. This difficulty increases when two or more non-woven sheets are supposed to be produced in the same pattern.

By using the plastic film provided according to the invention, drafting tendencies exhibited by the sheet that is supposed to be needled are substantially eliminated and/or largely balanced, so that an accurate production of patterned non-woven sheets in accordance with the grid patterns is simplified or even made possible.

According to a preferred embodiment of the invention, the non-woven pile is characterized in that the plastic film is disposed between at least two non-woven sheets, which are mutually needled, resulting in the fact that this configuration substantially covers the plastic film towards the outside on the finished product.

It is known to perform a partial impregnation of one or more non-woven sheets with a binding agent when producing patterned non-woven pile, so that a pattern is created during the needling step such that the patterned fibers become visible on the surface in the areas that have not been impregnated or vice versa.

The binding agent application on the partially impregnated non-woven sheet is typically performed such that this non-woven sheet, which is supposed to be impregnated partially, is transported jointly with the non-woven sheet, which is not supposed to be impregnated with binding agent, through a binding agent application device that is active on only one side.

During the process the undesirable effect may occur that the binding agent penetrates through the non-woven sheet, which is supposed to be impregnated partially, into the non-woven sheet that is not supposed to be impregnated, so that in these areas where the binding agent also penetrates into the second sheet the fibers are bonded, thus eliminating them for the pile formation.

However, if contrary to this the plastic film, which is provided according to the invention, is disposed between the two non-woven sheets, of which one is supposed to be partially provided with a binding agent application, prior to the application of the binding agent and hence also prior to the unpinning step, an effective barrier is formed, preventing the binding agent from penetrating into the second non-woven sheet.

Another preferred embodiment of the inventive non-woven pile is therefore characterized in that the plastic film is disposed between non-woven sheets with contrasting colors, of which at least one non-woven sheet is partially impregnated with a binding agent.

In agreement with the above explanations, the inventive method for producing a non-woven pile comprising at least one single- or multi-colored non-woven sheet is characterized in that the non-needled non-woven sheet is brought in contact with a plastic film across its surface and the fiber material of the non-woven sheet is needled through the plastic film to form the pile structure.

To produce a patterned non-woven pile, prior to the unpinning step the plastic film is placed between two non-woven sheets with contrasting colors, to at least one of which sheets a binding agent can be applied partially prior to unpinning.

In order to obtain a non-woven pile with velour character, it is provided additionally according to the invention that two panels, each comprising at least one non-woven sheet and one plastic film, are guided separately past one side of a common lamellar grid, that the two panels are unpinned simultaneously from both sides and that the unpinned non-woven sheet leaving the common lamellar grid is cut open substantially along its midplane.

Preferably a polyethylene or polypropylene film having a thickness of 70 to 300 μ, particularly 100 to 150 μ is used for the plastic film.

Embodiments of the invention will be explained in more detail hereinafter with reference to the figures,

wherein:

Fig. 1 is a schematic illustration of a sectional view of a first embodiment of the non-woven pile according to the invention;

Fig. 2 is a schematic illustration of a second embodiment of the non-woven pile according to the invention;

Fig. 3 is a schematic illustration of the production method for the non-woven pile with velour character according to the invention.

The non-woven pile illustrated schematically in Figure 1 substantially comprises a non-woven sheet 1 and a plastic film 2, wherein the arrow a reflects the needling direction, as a result of which the pile structure 5 is formed on the side of the plastic film 2 opposite the non-woven sheet 1. This surface comprising the pile

structure 5 forms the top or visible surface of the finished non-woven pile.

In the embodiment of a non-woven pile shown in Fig. 2, another non-woven sheet 3 is disposed opposite the non-woven sheet 1 on the opposite side of the plastic film 2, which sheet is provided partially with a binding agent application in the area of the locations 4. In the needling direction illustrated by the arrow a, fiber material is needled both through the plastic film and through the entire non-woven sheet 2 across the entire surface of the non-woven sheet 1 for the purpose of forming the pile structure 5, while fiber material is unpinned from the non-woven sheet 3 only in the regions of the surfaces to which no binding agent has been applied so as to form the pile structure. 5

In the method illustrated schematically in Fig. 3, material panels are guided along both sides of a lamellar grid 12, which panels comprise a non-woven sheet 1 or 1b, a plastic film 2 or 2b and another non-woven sheet 3 or 3b, respectively, to which partially a binding agent may be applied. In the area of the lamellar grid 12, unpinning occurs from both sides in the direction of the two arrows a and b. The resulting multi-layer panel is cut open in the area of its midplane by means of a knife 13 after leaving the lamellar grid, resulting in two non-woven pile sections, the surfaces of which have velour character. Two rollers 10 and 11 serve the guidance and support of the multi-layer panel.

The figures do not take into consideration that the thickness of the individual non-woven sheets changes as a result of the needling operation.

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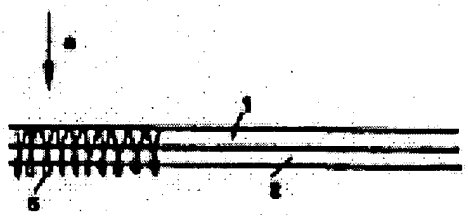

Fig. 1

Fig. 2

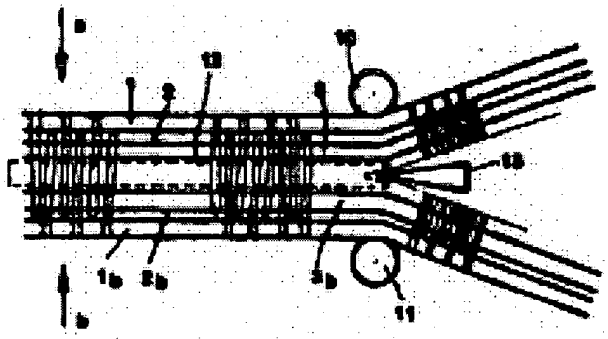

Fig. 3

130036/0210

Certification

Park Evaluations & Translations

TRANSLATOR'S DECLARATION: February 22, 2006

I, Kerstin Roland, hereby declare:

That I possess advanced knowledge of the German and English languages and that the attached translation is accurate and reflects the meaning and intention of the original texts.

Kerstin Roland

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